

PRINCIPAL EXAMINER'S REPORT



BOTSWANA
EXAMINATIONS
COUNCIL

2022

JCE GENERAL SCIENCE



GENERAL COMMENTS

The performance of the 2022 cohort was somewhat better as compared to the previous years. Candidates were able to recall, relate scientific concepts and apply basic scientific knowledge to given situations better than the previous years. Nonetheless, Candidates continue to show deficiencies in items that require science process skills, inferring relations of variables from experimental results and drawing conclusions based on information presented on graphs and tables. Centres are encouraged to expose learners to hands-on activities and items which will engage their high-order thinking skills and apply themselves rather than just engage in simple recall of information.

2022 Candidates did relatively well in demonstrating the ability to read the scale on instruments for plotting graphs though they failed to demonstrate the skill of using the line of best fit to join the points (in this case, a straight line).

Candidates continue to ignore mark allocation and hence continue to lose marks by leaving out certain points to get the full award. Centres are also encouraged to advise candidates not to repeat the questions as this takes a lot of space for the answer.



OVERALL PERFORMANCE BY CANDIDATES

SECTION A

1	<p>Fairly done</p> <p>The majority of the candidates were able to access the first two marks (progesterone and testosterone). Prostate which was the third correct response could not be accessed by many.</p>
2 (a)	<p>(i & ii) Poorly done</p> <p>Candidates lacked the knowledge of cells, tissues, organs and systems of plants. Common wrong responses were (i) plant cell, and plant: (ii) has a vacuole.</p> <p><i>Expected responses (i) leaf (ii) has chloroplasts.</i></p>
(b)	<p>Well done.</p> <p>Most candidates were able to state that it is the site for respiration, which was one of the expected correct answers. The most common incorrect response was stating the functions <i>of a nucleus</i></p> <p><i>Expected response: Energy production/stem cell regulation/calcium storage/programmed cell death/site for reactions/cell multiplication.</i></p>
3 (a)	<p>(i) &(ii) Poorly done</p> <p>Candidates used their general knowledge of habitats and ignored what was presented on the diagram, and hence could not access the marks. Common wrong responses were green land, water, land and grass.</p> <p><i>Expected responses: Grass land and Lake</i></p>
(b)	<p>Poorly done.</p> <p>Most candidates lost marks because they did not start the food chain with producers (green plants), some drew pyramids or just listed some components from the diagram.</p> <p><i>Expected response:</i></p> <p style="text-align: center;">Green plants → Tadpoles → Fish → Stork</p>



(c)	<p>Poorly done. Most of the candidates lacked knowledge of the concept and hence could not access the mark.</p> <p><i>Expected response: 4.</i></p>
4 (a)	<p>Well done. Instead of naming the blood vessel candidates named the type of the blood vessel. Hence the common wrong response was vein, A few candidates wrote pulmonary artery.</p> <p><i>Expected response: Pulmonary vein</i></p> <p>(b) (i&ii) Fairly done Fairly done. Most candidates managed to give the difference in (i), but failed to give the explanation in (ii). Some candidates differentiated the pulmonary vein from the aorta instead of the blood moving through them.</p> <p><i>Expected response: (i) blood in W oxygenated/blood in Z flows at higher pressure (ii) Z carries deoxygenated blood to the lungs</i></p> <p>(c) Poorly done Most candidates failed to address the difference in terms of structure but instead gave general differences which were not necessarily concerning structure.</p> <p><i>Expected responses: Vena cava has valves or no valves in Y/ vena cava has thinner walls or Y has thicker walls/ vena cava has large lumen or Y has small lumen/ Vena cava has fibrous wall and Y has elastic wall.</i></p>



<p>5 (a)</p> <p>(b)</p>	<p>(i&ii) Fairly done The use of scientific vocabulary and scientific facts correctly was a challenge. Most candidates gave the same definition for the two terms. Candidates missed the term deliberate/intentional which was key.</p> <p><i>Expected responses:</i></p> <p><i>(i) Miscarriage: spontaneous/natural pregnancy loss before the 20th week of gestation or the expulsion of an embryo/fetus weighing 500g or less.</i></p> <p><i>(ii) Abortion: deliberate termination of pregnancy before the 24th week of the gestation period.</i></p> <p>Fairly done Most candidates were able to state at least one cause of female infertility. Responses such as the use of medicines, drugs and traditional medicines could not sufficiently address the question.</p> <p><i>Expected responses: ovulation disorders/hormonal imbalance/fibroid/side effects of some drugs/pelvic inflammatory disease.</i></p>
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<p>6 (a)</p> <p>(b)</p> <p>(c)</p>	<p>Fairly done. Poorly done. Most candidates defined a drug instead of drug abuse. Some candidates went further to explain the effects/consequences (which were not required) of abusing drugs rather than just giving a simple definition.</p> <p><i>Expected response: the use of drugs in amounts or by methods which are harmful to the individual or others.</i></p> <p>Poorly done. Candidates just copied the stem “to have knowledge”, or simply stated the effects of drug abuse like in (a).</p> <p><i>Expected response: to prevent activities that may cause damage to body organs</i></p> <p>Fairly done. Most candidates were able to state at least one of the following: - respiratory diseases/cardio-vascular diseases (any named illness that falls in this bracket attracted a mark) - economic effects - addiction/misuse.</p>
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<p>7 (a)</p> <p>(b)</p> <p>(c)</p>	<p>(i&ii) Poorly done Most candidates just copied what was in the diagram (set up 1 has starch only while set up 2 has starch and amylase). Since candidates could not state the observation, they could not give an explanation.</p> <p><i>Expected response:</i> (i) Set up 2 – the reduced size of Viking tubing/solution becomes clearer/Set up 1 – the reduced size of Viking tubing</p> <p>(iii) Set up 2 - Break down of starch/diffusion of glucose into the water/Set up 1 - water moving into viking tubing.</p> <p>(i&ii) Poorly done. Candidates lacked the knowledge of the functions of enzymes and the end products of digestion. The common wrong responses for (i) were maltose and starch instead of glucose/simple sugar/reducing sugar.</p> <p>For part (ii) common wrong response was iodine solution instead of Benedict's solution. Candidates failed to recognize that amylase will break down the starch in set-up 2.</p> <p>Poorly done. The keywords from the stem were “digestion” and “movement of particles”, which candidates were to refer to in order to name the organ being represented. They failed to process the information given and relate it to the reality of the digestive system. Common wrong responses were stomach, oesophagus and lungs.</p> <p><i>Expected response: ileum/small intestine.</i></p>
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<p>8 (a)</p> <p>(b)</p>	<p>Poorly done. Most candidates failed to process the information given to be able to come up with what the investigation is about. Common wrong responses were respiration, evaporation and photosynthesis.</p> <p><i>Expected response: transpiration.</i></p> <p>(i&ii) Fairly done. Majority of the candidates were able to recognize that the reading will decrease but failed to explain that the decrease is due to water loss through the leaves.</p>
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(c) **Poorly done.**

The majority of the candidates did not attempt to this question.
A common wrong response was to prevent insects from eating the roots.

Expected response: To prevent the evaporation of water from the flask

9 (a) **Fairly done.**

Most candidates' responses were fertilization and description of what happens during birth, they ignored the keywords in the stem "development of the foetus in the womb of its mother".

Expected response: pregnancy.

(b) **Well done.**

Most candidates were able to capture the correct response as X.

(c) **Fairly done.**

The majority of the candidates were able to state the function of Y (amniotic fluid).

Expected response: protects the foetus from external shocks/ temperature control/lubrication.

10(a) **(i) Well done.**

This question was well answered though Some of the candidates did not follow instructions and circled at the question.

Expected responses: Increase

(ii) Poorly done.

Most candidates repeated the stem that air was pumped in the balloon, failing to explain what the air does that increases the weight.

Expected response: as the mass/number of particles/volume increases, the weight also increases.

(b) **Fairly done.**

Most candidates were able to state at least one property correctly. Common wrong responses were: air is weightless, air is test-less, air is order-less

Expected responses: air expands when heated; air /can be compressed; air is colourless; air is odourless; air occupies space. (any two)



11(a)	<p>Fairly done. Most candidates were able to state either one of the following: Copper II carbonate dissolves/disappears, the flask becomes warm, and bubbles are produced. (<i>these were the expected responses</i>).</p> <p>(b) Poorly done. There was a clear indication that candidates did grasp the concept of common chemical reactions of acids with bases and acids with metals, hence oxygen instead of carbon dioxide, <i>which was the expected response</i>.</p> <p>(c) Poorly done. Most candidates did not refer to the diagram but instead based their responses on other setups which they might have used. They mistook the investigation as if it was the collection of water. The common wrong response was carbon dioxide is slightly soluble in water. <i>Expected response was: Carbon-dioxide is denser than air.</i></p> <p>(d) Fairly done. Most candidates were able to give the test for the gas but failed to state the result of the test. Centres are encouraged to make use of the Assessment Syllabus on notes for qualitative analysis. A common wrong response was <i>turns cloudy or milky/cloudy</i>, making the answer to be wrong since cloudy is not accepted as a correct response. <i>Expected response:</i> <i>Test - bubble the gas in lime water</i> <i>Result - lime water turns milky</i></p> <p>(e) Well done. The majority of the candidates stated Oxygen, which was one of the expected correct responses. Common wrong responses were hydrogen and, carbon-dioxide. <i>Expected response: oxygen/nitrogen/water vapour/inert gases</i></p>
12(a)	<p>Poorly done. Most candidates swapped the parts of the embryo, hence common wrong response was radicle. <i>Correct Expected response: plumule.</i></p>



(b)	<p>Fairly done. Candidates seemed not to be familiar with some of the parts of a bean seed and their functions. Common wrong responses were seeds and stem.</p> <p><i>Expected response: Root</i></p>
(c)	<p>Fairly done. Some candidates did not make any attempt to respond.</p> <p><i>Expected response: stores food</i></p>

13(a)	<p>Fairly done. Though the candidates had an idea that the eye could have been exposed to light and darkness, failed to name the stimulus that caused the change. Common wrong responses were <i>darkness, torch, lightning, light/dark.</i></p> <p><i>Expected response: light.</i></p>
(b)	<p>Poorly done. The majority of the candidates failed to describe the antagonistic action of the muscles in the iris (R). Most responses were on the explanation of accommodation when the eye focuses on near and distant objects.</p> <p><i>Expected response: circular muscle contracts and the radial muscle relaxes.</i></p>
(c)	<p>Poorly done. Most candidates described reflection and some wrote incomplete descriptions and hence could not score all the marks.</p> <p><i>Expected response: A quick/involuntary response to a stimulus which helps an organism to adapt to an adverse circumstance that could have the potential to cause bodily harm or death.</i></p>

14(a)	<p>(i&ii) Fairly done. Candidates managed to state the observation (i. that balloons are inflated/filled with air), but failed to explain why that happens.</p> <p><i>Expected response to ii: pressure outside/atmospheric pressure is more than pressure in the alveolar spaces and air enters the balloons.</i></p>
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(b)	<p>Fairly done. Candidates missed the point that the model demonstrated breathing hence the common wrong responses were skin, shoulders and chest.</p> <p><i>Expected response: rib cage.</i></p>
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15(a)	<p>Fairly done. Although some candidates switched the modes of heat transfer, some were able to correctly state the methods of heat transfer.</p> <p><i>Expected responses: (i) Conduction (ii) Convection</i></p>
(b)	<p>Poorly done. Most candidates described the engine parts as they appeared in the diagram and failed to relate the movement of water to the convection current.</p> <p><i>Expected response: Heated water expands, becomes less dense and rises.</i></p>
(c)	<p>(i&ii) Fairly done. Majority of the candidates correctly answered part (ii) as air pollution but failed to state the type of energy in part (i) as Chemical energy. Common wrong responses were <i>kinetic energy and potential energy</i>.</p>

16(a)	<p>Fairly done. Though candidates were able to relate the diagram with photosynthesis and respiration, they failed to place the correctly. not Some candidates missed the word Carbon in the stem and hence nitrification was a common wrong response.</p> <p><i>Expected responses were L- Respiration M - Feeding.</i></p>
(b)	<p>Well done. Most candidates were able to name one of the correct responses. There were those that named the carbon compounds which were not found in plants. The most common incorrect response was <i>carbon dioxide</i>.</p> <p><i>Expected response: Carbohydrates/Starch/Simple sugars/Protein/Fats/Amino acids</i></p>



(c)	<p>Fairly done. Candidates failed to adequately demonstrate knowledge of how human activities contribute to increasing of carbon dioxide in the atmosphere. Common incorrect responses included the <i>use of fossil fuels, planting more trees and not cutting trees.</i></p> <p><i>Expected responses: mining/ burning of fossil fuels/deforestation.</i></p>
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SECTION B

17(a)	<p>(i) Fairly done. A good number of the candidates were able to name the appropriate instrument.</p> <p><i>Expected response: Stop clock/watch</i></p> <p>(ii) Fairly done. Most candidates took the reading at the top of the meniscus which gave a wrong reading. Common wrong response was 32.</p> <p><i>Expected response: 31.</i></p>
(b)	<p>(i) Fairly done. Most candidates managed to plot the points correctly. They however failed to use a smooth edge to draw the line of best fit(in this case a straight line). Majority joined each point to the next (using free hand or ruler) hence failing to come up with a straight line.</p> <p><i>Expected response: All 9 points correctly plotted (3 marks)</i> OR <i>6 – 8 points correctly plotted (2 marks)</i> OR <i>3 – 5 points correctly plotted (1 mark)</i></p> <p><i>Line of best fit (1 mark)</i></p> <p>(ii) Poorly done. (iii) Since candidates could not draw the expected graph (a straight line), they could not determine the gradient of the graph. Candidates were expected to pick any two points from the graph (not the table) and substitute in the gradient formula below</p> $m = \frac{y_2 - y_1}{x_2 - x_1} \quad (1 \text{ mark})$



	<p><i>Correct answer (1 mark); Correct units (1mark)</i></p>
(c)	<p>Poorly done. Most candidates gave general precautions which did not necessarily relate to the set up in question. Common wrong responses were zero error and putting the instrument on a level surface.</p> <p><i>Expected response: parallax error.</i></p>